SIMPLE METHODS OF HOUSE VENTILATION IN WINTER

PUBLISHED BY THE CANADIAN ASSOCIATION FOR THE
PREVENTION OF TUBERCULOSIS
1914

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AIR is a mixture of nitrogen and oxygen in the proportions of nearly four parts of nitrogen to one of oxygen, with in addition carbonic acid in minute quantities as 3 to 10,000 parts. Such air is best found over great expanses of water, forest and mountains where there are few or no residents. Wherever population increases and human industries are carried on many particles of dust from cultivated fields, streets, yards, smoke, stables, factories and the bodies of men and animals are found, there being often as many as 1,000,000 particles in a cubic foot of air, while the microbes in a hospital may reach 40,000 per cubic metre. Besides these there are the seeds of many plants and the spores of moulds and fungi, many of which live upon dead organic matter, while bacteria live in the air passages of man and produce disease. Naturally these are found most largely in inhabited rooms, especially in sick rooms, since they multiply there and are not carried readily away as they would be in free outer air. This is understood when we recall that while a zephyr breeze of five miles an hour will drive 25,000 feet of air past us in one hour if standing in the open, yet we think we are having splendid ventilation if the air in an ordinary room is changed six times in an hour.

Since all life and tissue change depend on the oxygen of the air we breathe, it is plain, as daily experience teaches, that the more we live in the open the better health will we have; but this also is partly due to the exercise which is taken, causing deeper breathing and greater consumption of oxygen and more rapid building up of tissues with the more food taken.

In the summer we can bring abundant fresh air into houses; but in cold weather both comfort and expense demand that the amount must be limited, unless people are in active movement. However, it is everywhere possible for people to sleep on balconies or in rooms with open windows, if kept warm with sufficient clothing. It is in school rooms, factories and the crowded houses and tenements of poorer people, however, that means must be found to supply warm, fresh air. By fresh air we mean

clean air in motion, air that is free from dust, from bacteria, from unpleasant odours and poisonous substances. Now it is quite possible on the one hand that on a windy day the outer air may fill a room with dust particles, if windows are open toward the wind, and on the other that with clean floors and walls and fresh sunshine the air in inhabited rooms may be more wholesome by being kept in motion than dusty air. But since oxygen is used up and organic matter increased in inhabited rooms, good health demands that outer air, varying in amount according to circumstances, should be brought directly or indirectly into all living rooms. Large buildings have fans drawing the air over steam coils and circulating it through rooms. But such plants are often expensive and to avoid that we may have the air of rooms driven by fans against a water spray and so washed of its particles and returned clean and relatively fresh to rooms again with an estimated saving in fuel of one-third in cold weather.

Except in exposed rooms on windy days outer fresh air can always be brought into living rooms, although in crowded cities it should be drawn through coarse canvas especially if taken near the ground. In houses having hot air furnaces it is not uncommon to circulate the house air by withdrawing air at a register in the front hall floor and carrying it back to the furnace to be *rewarmed*. In all such cases there should also be a fresh air duct leading to the space around the furnace to ensure fresh air.

In each method of ventilation hereinafter described provision is made for moistening the air by pans of water; for it is very desirable that sufficient humidity be ensured. Boiling kettles directly heated in rooms will serve this end. There is nothing more soothing to the mucous membranes of the mouth and nose of both the sick and the well than moisture, which ought to be at least 60 per cent. of the relative humidity or of the amount of moisture which the air of a room can hold. It serves also to lessen insensible evaporation from the body and makes a room temperature of 60° to 65°F. comfortable, while it also saves fuel and increases, as compared with higher temperatures, the amount of oxygen inhaled with every inspiration. Whenever a household has a sick person in it, especially a tuberculous patient, there must be special means adapted to supply fresh air:

(a) To assist in the recovery of the sick.

(b) To protect the well against infection.

To this end nothing serves the purpose better than a glass balcony, wherein the sick may recline, wrapped in abundant clothing, directly in fresh air. Where this is not available the window tent is readily arranged. This consists of an awning on the outside to protect against direct winds, with window sash

lowered above and raised below, while a tent arranged with canvas extends over the head of the bed. The same method may be extended to make a curtained compartment within a room thereby lessening the loss of indoor warmth and yet giving the patient the advantage of breathing cold, fresh air always of normal humidity. All persons, but especially the sick, should realize that at 30°F. below zero air contains in every cubic foot almost 25 per cent. more oxygen than at 70°F., and many years' experience at sanatoria shows that with the fresh air treatment tuberculous patients put on more flesh and make greater progress in winter than in summer. Recent extended experiments have shown that it is practical, even in cold weather, to place a screen made of a well stretched piece of cotton on a frame inside the upper window sash which has been drawn down, and thus supply a steady interchange of outer and inner air through a

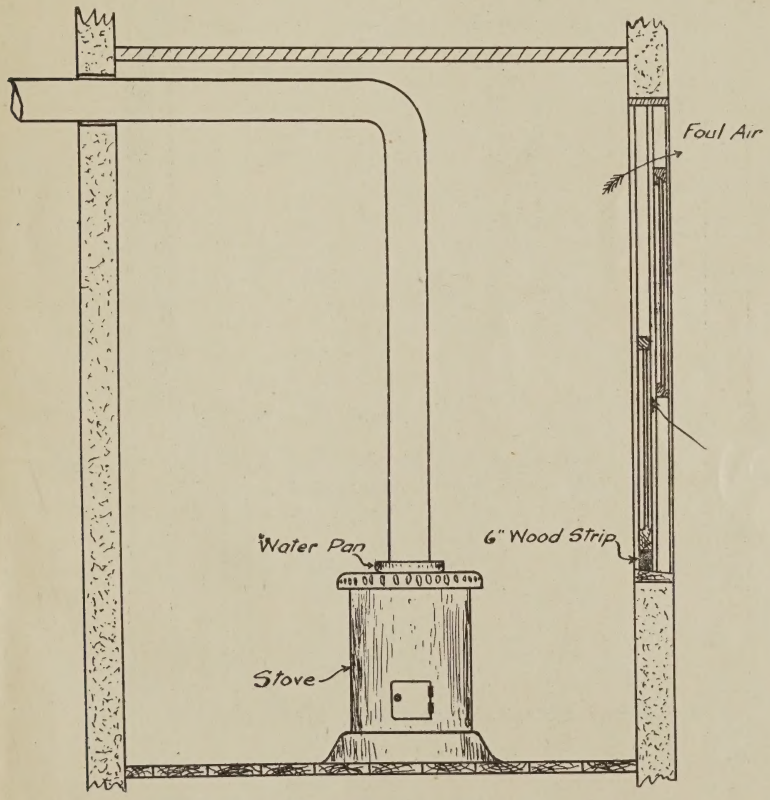

Diagram No. I.

Window Ventilation

substance which transfers much less heat from the room than the glass surface does. Where persons are not in active movement but sedentary, the air introduced into rooms must be warmed in cold weather; hence the following simple methods are given to show how living rooms, school rooms and work rooms may be supplied with fresh warmed air. Some one of them should be adopted, both to keep healthy people well and to make the sick better.

Diagram I.—Shows a simple method of window ventilation where the outer air passes upward and inward between the sashes to replace the air outgoing above the lowered sash. This method may be improved by placing a screen of cotton in the space made by the lowered sash.

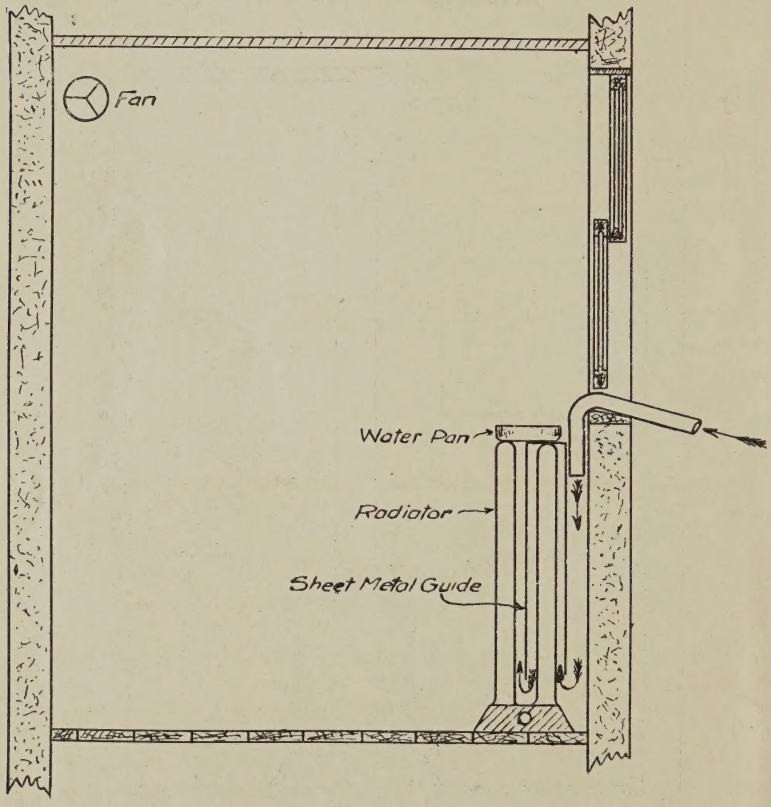

Diagram No. II.

Radiator and Fan Ventilation

DIAGRAM II.—Where steam heating is used, the above method of bringing in outer air by a 2-inch opening the width of the window, to be warmed by passing down and up by means of a diaphragm through the radiator is very effective. It may similarly be used with hot water heating, due care being exercised in very severe weather. The air is drawn in by a small fan in room near ceiling, or in the adjoining hall.

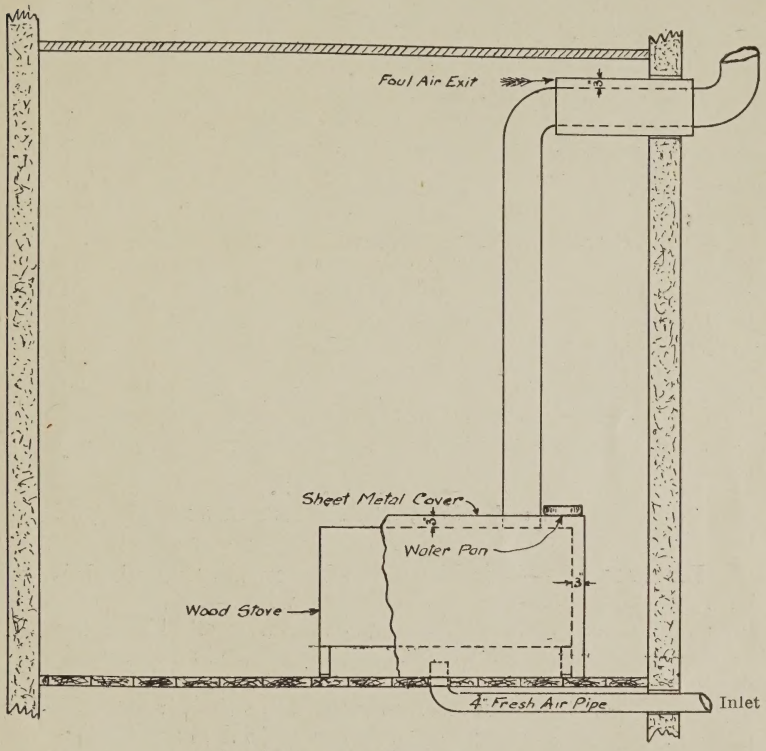

Diagram No. III.

Rural School and Camp Ventilation

DIAGRAM III.—This simple method of bringing in fresh air beneath a wood or coal stove, having an outer jacket with perforated top for exit of warm air and under which is placed a water pan, while the foul air is withdrawn by an outer duct surrounding the stove pipe, has been successfully used in country schools and lumber camps. In a large room the air is better diffused by having ducts placed in the four corners of the room leading from near the floor and connected with the outlet duct.

NOTE—The inlet should be kept free from snow and other obstructions.

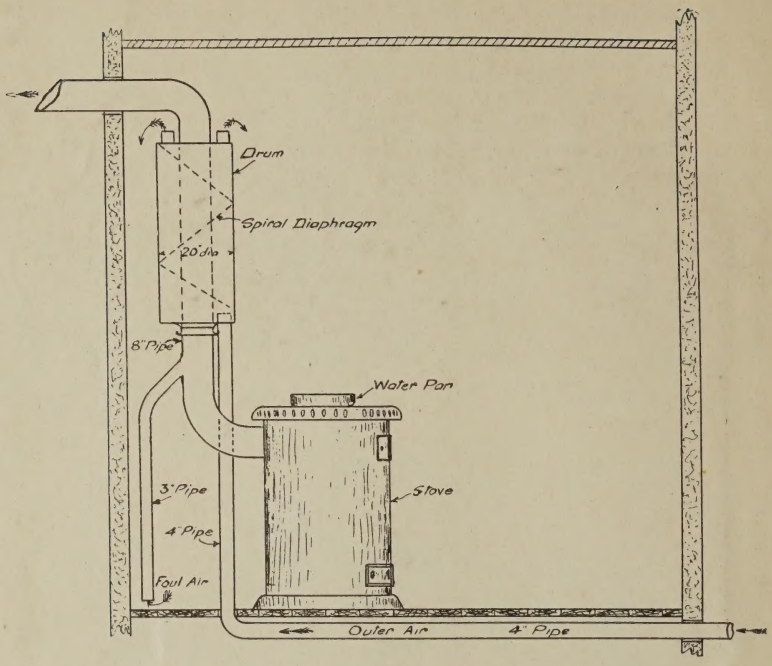

Diagram No. IV.

Drum Ventilator, with Foul Air Outlet

DIAGRAM IV.—This simple and economical method is extremely satisfactory in houses heated with stoves, doing much the same work as the ordinary hot-air furnace. The drum can be supported by a bracket when slipped on to the stove pipe, while the spiral diaphragm causes the outer cold air brought in by ducts below the floor to circulate around the pipe, thus being warmed before entering the room. The foul air is drawn into the smoke pipe from near the floor, thereby bringing the warm air to the floor and causing a remarkably even temperature throughout the room.

The several factors comprising good ventilation are illustrated in each method. These are *fresh air, warm air, moist air, evenly diffused air,* and air in motion. No *house* can be healthful without proper ventilation, and no one should neglect it.

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